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Effect of NAA and IBA on rooting parameters of stem cutting of Hibiscus (*Hibiscus rosa-sinensis* L.)

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Abstract

The present experiment was carried out to evaluate the "Effect of NAA and IBA on rooting and shooting parameters of stem cutting of Hibiscus (*Hibiscus rosa-sinensis* L.)" was conducted during the February month of year 2024-25 under Shade net house at the College of Horticulture and Research Station Saja, Bemetara, Mahatma Gandhi University of Horticulture & Forestry, Durg (C.G.). A complete random design was used for statistically analysed of data, which consisted of 9 treatments and replicated thrice. the experiment included four levels of plant growth regulators viz. NAA (500 mg/ L, 1000 mg/L, 1500 mg/L, 2000 mg/L) and IBA (500 mg/ L, 1000 mg/L, 1500 mg/L, 2000 mg/L), and untreated (Distilled water) used as control. The present research revealed that the treatment T₈ (IBA 2000 mg/L) was the most effective in promoting overall growth and rooting of cuttings, as it recorded the superior rooting parameters including number of roots (13.27), root length (19.73 cm), rooting percentage (90.00%), and both fresh root weight (1.21 g.) and dry root weight (0.163 g.). Thus, T₈ (IBA 2000 mg/L) proved to be the best treatment for enhancing propagation success and root development in cuttings.

Keywords: Hibiscus, NAA, IBA, Stem cutting, plant growth regulators

Introduction

Hibiscus (*Hibiscus rosa-sinensis* L.) is national flower of Malaysia and Hibiscus belongs to Malvaceae family. It is native from tropical Asia (Vietnam and Southern China). (Chates D.B., 2019) It is commonly grown in India, Hawaii, Fiji, California and Florida. There are around 300 related species of hibiscus found throughout the tropics. The four main species of hibiscus having ornamental value and cultivated in tropics and sub tropics are *Hibiscus rosa-sinensis* L., *Hibiscus mutabilis* L., *Hibiscus syriacus* L., and *Hibiscus schizopetalus* Hook.

Hibiscus is one of the most beautiful flowering and evergreen shrub. Hibiscus is used as ornamental flowering shrub in the garden. Also used as flowering hedge, shrubby border and potted plant for home garden The Hibiscus is used as an offering to goddess Kali and Lord Ganesha in Hindu worship. Essential oil of this plant has antifungal activity and one of its constituents was found to be used against human cancer. The leaves are useful in healing of ulcer and promoting hair growth activity.

Hibiscus rosa-sinensis is a medium-to-tall shrub with dark green serrated leaves and showy flowers in single, semi-double, or double forms, available in many colours. Some varieties have variegated foliage. It thrives in sunny, humid conditions with porous soil, best planting time is early winter in high-rainfall areas. While sun-loving, some types (e.g., "Netaji") tolerate partial shade (Savaliya *et al.*, 2017) [5].

Hibiscus is propagated vegetatively by cuttings and layering and grafting in hybrid varieties, Hibiscus is mainly propagated by layering during the monsoon, but this method is slow, labour- intensive, requires large amounts of plant material, and takes months for rooting. Growing plants from cuttings is an economical, easier, and more effective way to use less plant material. Cutting is the most practical vegetative growth technique among the other techniques. Hardwood, semi-hardwood, and softwood stems are utilized to propagate hibiscus through similar cuttings. The rooting of hibiscus cuttings depends on the type of wood used, making proper wood selection important. Root-promoting hormones also play a key role in helping cuttings form rooting and survive (Jagdishbhai, 2013) [4].

Materials and Methods

The present investigation on “Effect of NAA and IBA on rooting and shooting parameters of stem cutting of Hibiscus (*Hibiscus rosa-sinensis* L.)” was carried out at the during February month of year 2024-25 at the College of Horticulture and Research Station Saja, Bemetara, Mahatma Gandhi University of Horticulture & Forestry, Durg (C.G.). A complete random design was used for statistically analysed of data, which consisted of 9 treatments and replicated thrice, The experimental area is located in the central part of the Chhattisgarh Plains, between latitudes 21°30'25" to 22°01'14"N and longitudes 81°08'23" to 81°46'19"E., The experiment consisted of nine treatments including a control. The control treatment was maintained without the application of plant growth regulators (T₀). Four levels of Naphthalene Acetic Acid (NAA) were used, namely T₁ – NAA (500 mg/L), T₂ – NAA (1000 mg/L), T₃ – NAA (1500 mg/L), and T₄ – NAA (2000 mg/L). Similarly, four levels of Indole-3-butyric Acid (IBA) were applied, which included T₅ – IBA (500 mg/L), T₆ – IBA (1000 mg/L), T₇ – IBA (1500 mg/L), and T₈ – IBA (2000 mg/L), Semi hardwood cutting are used and cuttings were treated using the quick dip method, where the basal ends of the prepared cuttings were immersed in a growth regulator solution to a depth of 2.5 to 3.0 cm for a duration of 2 minutes.

Result and Discussion

1. Rooting parameter

1.1 Number of roots per cutting

The data presented in Table 1 and fig. no. 1 Among the treatments, cuttings treated with IBA at 2000 mg/L (T₈) produced the maximum number of roots per cutting (13.27), which was significantly superior to all other treatments. This was followed by IBA at 1500 mg/L (T₇), which recorded 11.67 roots per cutting, minimum number of roots per cutting (3.43) observed in the untreated control (T₀), IBA is a highly effective auxin for inducing root initiation in hibiscus cuttings. In this study, higher concentrations (1500-2000 mg/L) of IBA significantly increased the number of roots per cutting Comparable results were reported by including Torkashvand and Shadparvar (2012) [8], Singh *et al.* (2014) [6], Yeshiwas *et al.* (2015) [7], Chowdhuri *et al.* (2015) [2].

1.2 Percentage of rooted cutting

The data clearly show in table no. 1 and fig. no. 1 that rooting in cuttings was greatly accelerated by all growth regulator treatments. Semi hardwood cuttings treated with IBA 2000 mg/L (T₈) showed the highest rooting (90.00%), followed by NAA 2000 mg/L (T₄) and IBA (1500 mg/L) (T₇) (85.37% and 84.47%, respectively). In contrast, semi-

hardwood cuttings without growth regulator (T₀) showed the least Percentage of rooted cutting (45.93%). IBA is more stable and less prone to enzymatic degradation than other auxins, allowing prolonged activity in plant tissues. IBA promotes adventitious root initiation and development, while also enhancing carbohydrate translocation and nutrient mobilization at the basal region, thereby increasing the percentage of rooted cuttings., Similar results were also reported by Yeshiwas *et al.* (2015) [7], Singh *et al.* (2014) [6].

1.3 Length of longest root per cutting (cm)

The data presented in Table 1 and fig. no.1 the maximum root length (19.73 cm) was observed in treatment T₈ (IBA 2000 mg/L), which was statistically superior over all other treatments. This was followed by T₇ (IBA 1500 mg/L) with 17.67 cm and minimum root length reported in T₀ (6.63cm), Indole-3-butyric acid (IBA) is widely recognized as one of the most effective auxins for promoting adventitious root formation in stem cuttings. In *Hibiscus rosa-sinensis*, application of IBA significantly enhances root length by stimulating both the initiation and elongation processes, similar findings have been reported by several researchers, where the application of NAA and IBA including Ghorbani *et al.* (2021) [3], Yeshiwas *et al.* (2015) [7], Savaliya *et al.* (2017) [5], Torkashvand and Shadparvar (2012) [8].

1.4 Fresh weight of roots per cutting (g)

The data presented in Table 1 and fig. no. 1 Among the treatments, the highest fresh root weight (1.21 g) was recorded with IBA at 2000 mg/L (T₈), which was closely followed by IBA at 1500 mg/L (1.05 g). Both treatments were found to be statistically superior over the control (0.56 g). This clearly indicates the pronounced effect of IBA in enhancing root biomass compared to NAA treatments., IBA works better because it is more stable and active for a longer time in plant tissues. and stimulates root initiation, leading to longer and thicker roots that absorb more water and nutrients, resulting in higher fresh root weigh Similar results were also reported by Savaliya *et al.* (2017) [5], Yeshiwas *et al.* (2015) [7], Jagdishbhai (2013) [4].

1.5 Dry weight of roots per cutting (g)

The data presented in Table 1 and fig. no. 1 The highest dry weight of 0.163 g was achieved treated with IBA at 2000 mg/L (T₈), followed by 0.123 g at IBA 1500 mg/L (T₇), and minimum dry weight of roots per cutting found (0.077g) in untreated cuttings (T₀), IBA performs better because it is more stable, degrades slowly, and strongly promotes root initiation and elongation. This leads to greater root growth, higher dry weight, and better establishment of cuttings the Similar results were also reported by Savaliya *et al.* (2017) [5], Yeshiwas *et al.* (2015) [7], Jagdishbhai (2013) [4].

Table 1: Effect of Different Growth Regulators on rooting parameters of stem cutting of *Hibiscus rosa-sinensis* L.

Notations	Treatments Details	Number of roots per cutting	Percentage of rooted cutting	Length of longest root per cutting (cm)	Fresh weight of roots per cutting (g)	Dry weight of roots per cutting (g)
T ₀	Without PGRs (control)	3.43	45.93	6.63	0.56	0.077
T ₁	NAA (500 mg/L)	5.87	68.40	9.47	0.68	0.087
T ₂	NAA (1000 mg/L)	6.63	72.50	12.73	0.73	0.097
T ₃	NAA (1500 mg/L)	10.93	80.17	15.47	0.93	0.120
T ₄	NAA (2000 mg/L)	11.43	85.37	16.47	0.94	0.120
T ₅	IBA (500 mg/L)	8.87	78.87	13.97	0.73	0.107
T ₆	IBA (1000 mg/L)	9.30	81.87	14.67	0.84	0.113
T ₇	IBA (1500 mg/L)	11.67	84.47	17.67	1.05	0.123
T ₈	IBA (2000 mg/L)	13.27	90.00	19.73	1.21	0.163
	SEM	0.24	1.60	0.33	0.02	0.003
	CD	0.72	4.75	1.00	0.06	0.009

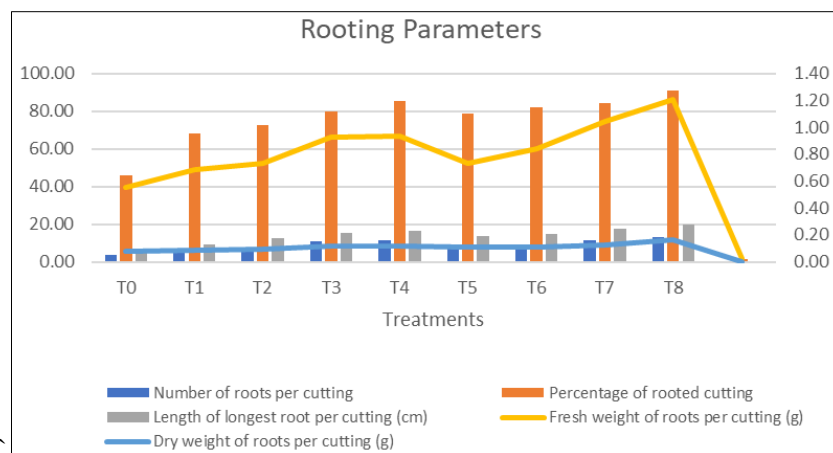


Fig 2: Effect of Different Growth Regulators on rooting parameters of stem cutting of *Hibiscus rosa-sinensis* L.

Conclusion

On the basis of present experiment, it can be concluded that the treatment T₈ (IBA 2000 mg/L) was the most effective in promoting overall growth and rooting of cuttings, as it recorded the superior rooting parameters including number of roots (13.27), root length (19.73 cm), rooting percentage (90.00%), and both fresh root weight (1.21 g.) and dry root weight (0.163 g.). Thus, T₈ (IBA 2000 mg/L) proved to be the best treatment for enhancing propagation success and root development in cuttings.

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